ACCESSIBILITY OF ADOPTERS OF IMPROVED RICE FARMERS TO PRODUCTION RESOURCES IN AGRICULTURAL ZONE I OF NIGER STATE, NIGERIA

***Salihu, I. T., * *Dauda, S. N., **Shaba, E., and *L. T. Yusuf**
***Department of Agricultural Economics and Extension Technology,**
Federal University of Technology, Minna, Niger State, Nigeria.
****National Cereals Research Institute (NCRI), Badegi, Niger State, Nigeria.**
Email- ibrahimtyabo@yahoo.com Phone no: *08069098599*

Abstract

Level of access and affordability of production resources is a limiting factor for widespread adoption of improved seed varieties. It is on this bases, the study attempts to assess the level of accessibility of adopters of improved rice farmers to production resources in agricultural zone 1of Niger State, Nigeria. Multistage random sampling procedure was used to select a total of 135 respondents for the study based on the proportion of population of the respondents in the selected cells. Interview schedule was used to elicit information from the respondents. The responses were analyzed using frequency counts, percentage and mean scores. The result revealed that majority of the respondents have high level of farming experience (82.2%), low level of education with only 34.1% having up to secondary level of education and only 10.4% acquired credit from banks. The production resources with the least level of accessibility by the respondents in the study area were fertilizer ($\bar{X} = 2.40$), *tarpaulin* ($\bar{X} = 1.89$), *credit* ($\bar{X} = 1.81$), *irrigation water pump engine* ($\bar{X} = 1.60$) *and tractor* ($\bar{X} = 1.56$), *The major motivating factors influencing adoption of improved rice varieties include attributes such as early maturity* ($\bar{X} = 4.79$), *more superior in terms of consumer preference* ($\bar{X} = 4.44$), *higher yield* ($\bar{X} = 4.41$), *and high market value* ($\bar{X} = 4.06$). *In conclusion, fertilizer, credit, mechanization, tarpaulin and irrigation water pump were the least production resources accessed by the adopters of improved rice varieties in the study area. Hence it is important for development agencies and policy formulators to put into consideration degree of accessibility of potential adopters to the above mentioned production resources in the design of their programmes, this will influence adoption of improved technology in a sustainable manner and improvement of the livelihood of rural households. On the credit facilities, the farmers should form cooperatives so as to meet up with present requirements of the Central Bank of Nigeria (Anchor borrower's programme) to acquire credit at lower interest rates to increase their input purchasing power.*

Key words: Production resources, level of accessibility, adoption, improved rice varieties.

INTRODUCTION

Rice is a staple food accepted by many Africans and makes up a great part of the dietary constituents of most of the population. As a result of population increase in the past 30 years, requirement for rice has significantly increased at a constant rate in sub-Saharan African. Rice has

played a great role in the planning policies for food security of several countries in this region. Hence, among the major purpose of the International year of Rice is to draw attentions to the position or role this major food could play in addressing the problem of food insecurity and also poverty (WARD, 2002). In order to reduce the food insecurity gap and increase farmers output through adoption of improved rice varieties production resources must be readily available and accessible to farmers at affordable cost.

The diffusion of the improved rice varieties (IRV) and its adoption can greatly increase rice yield per unit area of land if production resources are easily accessible and affordable to the users. This will help rice farmers to boost their production activities. Access to improved seeds and other inputs of production are factors that stimulate technology adoption and increasing agricultural productivity in smallholder agriculture. However, access to these inputs is constrained by weak supply systems in many sub-Saharan African (SSA) countries; the systems have been identified as limiting factors for widespread adoption of improved seed varieties (Tripp, 2000).

From the view of diffusion of innovation theory, a technology has four main elements that may influence its adoption. They are the innovation itself, the communication channels time and the social context within which the adopters' institution is located (Rogers, 1995). Viewed from a multi-disciplinary perspective adoption is a multi-dimensional process dependent on many factors such as profitability, cost of establishment (specifically production resources), compatibility with the value systems and the ability of the originators of the technology to communicate adequately the new knowledge and information to the potential adopters (Njuguna *et al.,* 2015).

The presence of agricultural agencies (NCRI) that promote production of improved rice varieties to increase farmers' productivity and income, increase food production and be self-sufficient in the area of food security as well as alleviate poverty is expected to enhance level of adoption of improved varieties especially in the study area. However, despite the favorable climate, good plain soil condition, development of improved rice varieties and their transfer to farmers through extension services, rice production still remain low in the study area. This problem can be attributed to low level of accessibility and affordability of production resources among small holder farmers involved in adoption of improved rice varieties.

Access to production resources is one of the key elements of farmers' empowerment and a base for the attainment of the Millennium Development Goals. Ownership, access and control over agricultural production resources constitutes critical elements in the determination of rural farmers' capacity to employ improved technology as a measure of boosting production level (Quisumbing and Pandolfelli, 2010). Adoption of agricultural technology and the production resources use are the outcomes of optimization by heterogeneous agents (Janvry *et al*, 2010). This optimization takes place in the presence of both the technology and combination of other inputs (production resources). Thus, farmers are assumed to maximize their utility function subject to the level of accessibility and affordability of these resources (Asfaw *et al., 2012).*

Inequality in the distribution of agricultural production resources among rural farmers is linked with production inefficiency, but yet interventions targeting small holder farmers often fail to address farmers lack of access to and control of important agricultural production resources (Quisumbing and Pandolfelli, 2010). Evidence from empirical studies on Africa confirm that farmers in Sub-Saharan Africa (SSA) face a host of challenges, ranging from infrastructure, incentives/production resources, and liquidity, which impedes adoption and sustainability of agricultural technology (Kijima *et al*., 2011; Bezu and Holden, 2008 and Poulton *et al.*, 2006). Despite the fact that numerous empirical researches has been conducted on factors that influence adoption of improved rice technology under diverse production, economic, and environmental conditions, little is known about the level of accessibility of farmers to production resources at farm or plot level in the study area. In order to fill this research gap, this study attempts to assess the level of accessibility of adopters of improved rice farmers to production resources in agricultural zone 1of Niger State, Nigeria. The specific objectives are to:

I. describe the socio-economic characteristic of adopters of improved rice varieties in the study area.
II. examine the types of production resources accessed by adopters of improved rice varieties in the study area;
III. assess the level of accessibility of adopters of improved rice varieties to production resources in the study area and
IV. examine the respondents' perception on motivating factors influencing adoption of improved rice varieties in the study area.

Methodology

This study was conducted in agricultural zone I of Niger State, Nigeria. The State lies on Latitude 8^0 to 11^0 30' North and Longitude 3^0 to 7^0 40' East. The total land area of the State is about 76,481Km or about 8.3 million hectares which represent 8% of the total land area of Nigeria. It has a mean annual rainfall of 1,350 mm with an average temperature of 27^{oC}. As at 2006, it has a population of 3.9 million in 2006 and the projected figure of 5.253 million persons in 2015 using growth rate of 3.2 percent (NPC, 2006). Agriculture is the major occupation of the people with about 85% of the population engaged in farming.

Multistage random sampling procedure was adopted for the study. The first stage involved random selection of three Local Government Areas (LGAs) from the State. The second stage involved purposive selection of one (1) extension Block from each local government noted for rice production. The third stage involved the use of simple random sampling technique to select three extension cells from each Extension blocks and a total of 135 respondents were selected based on the proportion of population of the respondents in the selected cells. Interview schedule was used to elicit information from the respondents. The responses were analyzed using frequency counts, percentage and mean scores. A four points Likert rating scale of very accessible (VA) = 4, always accessible (AA) = 3, sometimes accessible (SA) = 2 and not accessible (NA) = 1 was used to determine the respondents' perception on level of accessibility to production resources. Production resources with mean scores greater than or equal to 2.5 ($\geq$ 2.50) were considered as "Accessible"

and below the mean scores of 2.5 (<) were considered as "Not accessible". About 18 production resources were considered which includes; family labour, hire labour, mechanization, fertilizer, insecticide, herbicide, improved seed, credit, extension contact, farm management decision power, sickle, hoe, cutlass, tarpaulin, knapsack sprayer, irrigation water, irrigation water pump and membership of cooperative society. Similarly, the mean scores of Strongly agree (SA = 5), Agree (A = 4), Undecided (U = 3), Disagree (DA =2) and Strongly disagree (SD = 1) was used to rank the perception of respondents on motivating reasons that influence the adoption of improved rice varieties in the study area. The aggregate mean score of 3.0 was considered as a decision point. The score was rated as follows, weighted mean scores of 3.0 and above were considered as "Favourable perception" and less than 3.0 as "Unfavourable perception".

Results and Discussion

Age: Age variation is significantly associated to farmer's behavior in accepting new techniques. The results in Table 1 revealed that majority (85.1%) of the respondents were within the age range of between 31-50 years with mean age of 40 years. This implies that majority of the respondents were still in their active and productive age, people in this age category are likely capable to supply the labour requirement in all activities during the production process of adopting improved rice varieties.

Educational level: This refers to the educational attainment of respondents which equips individuals on how to handle issues that arise in life through searching for information, how to access, utilize and apply the content of the information appropriately to build on individual's skills and knowledge that can be applied on multiple activities to manage situations, achieve sustainable livelihood strategies to earn more income in order to improve their wellbeing. Hence, it is an important determinant of adoption of new practices which serve as instrument for acquiring on successful implementation of new practices appropriately. The result in Table1 revealed that only 34.1% of the respondents had up to secondary level of education, this implies that the educational of the respondents is low. This may directly or indirectly affect their level of adoption of new technologies. A good level of education is likely to equip an individual with knowledge and experiences to follow the instruction in the process of adoption. Mustapha *et al. (2012)* asserted that a fair level of education among the rice farmers could have a great impact on adoption of improved rice technology by making their behaviours and attitudes to be positive towards adoption. Hence, low level of education among rice farmers could have a great impact on adoption of improved rice technologies as it is likely to affect their ability to interpret and understand some of the technology packages in the process of adoption.

Years of farming experience: The result in table1 indicates that majority (82.2%) of the respondents had been producing rice for more than 16 years. This implies that majority of the rice farmers are experience farmers, with a mean experience of 22 years. The result validates the findings of Adedeji *et al. (2013),* who reported that the average year of farming experience of rice farmers was 19.71 years. The high level of years of farming experiences in rice production is likely to justify their perception on the types of variety to cultivate and choices of production resources that will boost their output.

Sources of credit: Access to credit facilities helps farmers to invest in the purchase of production resources. Therefore, if farmers can access credit at the right time with minimum constraints their chance of adopting improved technologies is likely to increase (Njuguna *et al., 2015).* The results

in Table 1 shows that slightly above one-third (39.3%) of the respondents' access credit through cooperative societies while only 10.4% acquired credit from banks. The inaccessibility of credit facilities through banks cannot be unconnected to challenges of lack of collateral faced by small holder farmers that results to low access to credit in most sub-Saharan African countries (World Bank, 2008).

Table 1: Socio –Economic Characteristics of Respondents in the Study Area (n = 135)

Variables	Frequency	Percentage	Mean
Age			
< 31	35	25.9	
31-40	42	31.1	
41-50	38	28.1	
>50	20	14.8	**40 years**
Education level			
Primary	33	24.4	
Secondary	46	34.1	
Post-secondary	13	9.6	
Non formal Education	43	31.9	
Years of Rice farming experience			
< 16 years	24	17.8	
16-20 years	49	36.3	
21- 30 years	39	28.9	
>30 years	23	17.0	**22 years**
Sources of credit			
Personal saving	37	27.4	
Bank loan	14	10.4	
Co-operative society	53	39.3	
Friends/relatives	34	25.2	

Source: Field Survey, 2016.

Types of production resources accessed by respondents

The result Table 2 Shows that majority of farmers in the study area had access to most production resources within the range of between 82.2% - 99.3% except credit (50.4%), tractor (41.5%), tarpaulin (37.8%) and irrigation water pump engine (28.1%) showing lowest scores of accessibility by farmers. This implies that high proportion of adopters of improved rice varieties in the study area could access most of the production resources except few ones with low percentage scored mentioned above. Easy access to production resources by farmers is likely to have positive effect on the adoption of improved rice varieties as this will influences their ability to implement the recommended specified practices in the process of adoption. The low access to tractor can be attributed to the fragmented nature of the farm lands and the cost of hiring and purchasing the machines are very expensive which average farmers could not afford. However, the low access to tractor which could ease land cultivation and expansion for large farm size has a negative consequence on the farmers' productivity. Similarly, the low access to tarpaulin is likely to effect

the level of cleanliness of rice especially in the process of threshing and sun drying after parboiling. This may ultimately affect the quality and its market value. The low access to irrigation water pump engine cannot be unconnected to their use to rain fed system of rice production or little knowledge about the utilization of this machine to irrigate the farm land with the available water which could boost production especially in the face of low rainfall and incidences of drought. Access to production resources at affordable cost especially good quality seed, tractor, agro-chemicals, fertilizer and credit facilities which could increase the farmers' purchasing power of inputs could motivate farmers to adopt new technologies and also lead to increase in output of rice farmers (Buah *et al.* 2011; Umeh, 2015).

Table 2: **Distribution of respondents according to production resources accessed**

Variables	Frequency	Percentage	Rank
Hired labour	130	96.30	3rd
Family labour	116	85.90	6th
Access to credit	68	50.40	11th
Irrigation water pump engine	38	28.10	14th
Access to tractor	56	41.5	12th
Fertilizer	75	55.56	10th
Irrigation water	116	85.90	6th
Knap sack sprayer	123	91.10	5th
Tarpaulin	51	37.80	13th
Improved seed	131	97.00	2nd
Farm management decision	111	82.20	8th
Access to extension contact	80	59.26	9th
Access to herbicide	126	93.33	4th
Sickle	130	96.30	3rd
Hoe	135	100	1st
Cutlass	130	96.30	3rd
Insecticide	113	83.7	7th

Source: Field Survey, 2016.

Level of access to production resources

The result in Table 3 shows the distribution of the mean score and standard deviation of the respondents' perception on the level of production resources accessed by the farmers. From the result the production resources with the high mean score level of accessibility were hoe ($\bar{X} = 3.38$), cutlass ($\bar{X} = 3.36$), sickle ($\bar{X} = 3.33$), herbicide ($\bar{X} = 3.09$), irrigation water($\bar{X} = 2.96$), family labour, insecticide and knapsack sprayer ($\bar{X} = 2.90$), improved seed ($\bar{X} = 2.89$), extension contact ($\bar{X} = 2.86$), hired labour ($\bar{X} = 2.75$) and farm management decision making ($\bar{X} = 2.61$). On the other hand, production resources with low mean scores were fertilizer ($\bar{X} = 2.40$), tarpaulin ($\bar{X} = 1.89$), credit ($\bar{X} = 1.81$), irrigation water pump engine ($\bar{X} = 1.60$) and tractor ($\bar{X} = 1.56$). The ability of rural farmers to adopt improved technologies and maximize their utility function is subject to the level of accessibility and affordability of production resources that can be combined to improve their output (Asfaw *et al., 2012).* Adoption of agricultural technology and the level of production resources use are the outcomes of optimization by heterogeneous agents (Janvry *et al.*, 2010).

Table 3: Distribution of respondents' level of accessed to production resources (n=135)

Production resources	VA	AA	SA	NA	Mean (std)
	Frq (%)	Frq (%)	Frq (%)	Frq (%)	
Hired labour.	27 (20.0)	49 (36.3)	57 (42.2)	2 (1.5)	2.71*(.78909)
Family labour.	21 (15.6)	94 (69.6)	6 (4.4)	14 (10.4)	2.90*(.78106)
Access to credit.	8 (5.9)	23 (17.0)	39 (28.9)	65 (48.1)	1.81(.92637)
Irrigation water pump.	10 (7.4)	19 (14.1)	13 (9.6)	93 (68.9)	1.60(. 98648)
Access to mechanization.	4 (3.0)	11 (8.1)	41 (30.4)	79 (58.5)	1.56(.76944)
Access to fertilizer	17 (12 .6)	26 (19.3)	86 (63.7)	6 (4.4)	2.40(.76490)
Irrigation water	17 (12.6)	105 (77.8)	4 (3.0)	9 (6.7)	2.96*(. 65115)
Knap sack sprayer	19 (14.1)	94 (69.6)	12 (8.9)	10 (7.4)	2.90*(.72146)
Access to tarpaulin	12 (8.9)	36 (26.7)	12 (8.9)	75 (55.6)	1.89(.08357)
Access to improved seed	23 (17.0)	80 (59.3)	27 (20.0)	5 (3.7)	2.89* (.71523)
Farm management decision	4 (3.0)	87 (64..4)	32 (23.7)	12 (8.9)	2.61*(.69093)
Extension contact	12 (8.9)	96 (71.1)	23 (17.0)	4 (3.0)	2.86*(.60053)
Herbicide	29 (21.5)	90 (66.7)	15 (11.1)	1 (7)	3.09*(.59182)
Sickle	46 (34.1)	88 (65.2)	1 (7)	-	3.33* (.48868)
Hoe	51 (37.8)	84 (62.2)	-	-	3.38*(.48664)
Cutlass	49 (36.3)	86 (63.7)	-	-	3.36*(.48265)
Insecticide	48 (35.6	44 (32.6)	25 (18.5)	18 (13.3)	2.90*(.03574)

VA=Very Accessible, AA= Always Accessible, SA= Sometimes Accessible, NA= Not Accessible. *implies highly accessible production resources.

Source: Field Survey, 2016.

Perception on motivating factors influencing adoption of improved rice varieties

Farmers' perception on a technology is expression feelings about the importance of attributes of the technology to be adopted and this may influence the decision of whether to adopt or not (Idrisa *et al., 2010).* The result in Table 4 revealed that among the favourable perception on motivating factor influencing adoption of improved rice varieties include early maturity($\bar{X} = 4.79$), more superior in terms of consumer preference($\bar{X} = 4.44$), higher yield ($\bar{X} = 4.41$) and high market value($\bar{X} = 4.06$). This implies that farmers agreed that improved rice varieties matured early, more preferred by consumers, gives higher yield and market value than the local varieties. This was because the choice of rice seed to be cultivated is an important input in production as well as the major factor determining the quality of crop and quantity of yield harvested. The attribute of early maturity is especially important in meeting up with the challenges of food security, gives the farmers the tendency to cultivate it more than once in a year and as well help in averting crop failure associated with short rain fall duration and check mate the effect of climate change that may result from incomplete raining season. The attributes of better preferred by consumers, higher yield and more market value gives the farmers the opportunity to earn more income for him and the family which may positively influence their standard of living. This finding validates the research of Kaguongo *et al.,* 2008; and Idrisa *et al.,* 2010) who reported that farmers' perception about a technology influences its adoption.

Table4: Distribution of respondents' perception on motivating factors influencing adoption of improved rice varieties (n = 135)

Perception statements	SA	A	U	D	SD	WS	WM
	F (%)	F (%)	F (%)	F (%)	F (%)		
1. Improved rice varieties give higher yield	95(70)	15(11.1)	20(14.8)	-	-	595	4.41*
2. Taste and grain quality are reasons for choosing improved rice varieties	25 (18.51)	31(22.96)	8(0.06)	39(28.89)	32(23.70)	383	2.84
3. Early maturity is a motivating factor for adoption of improved rice varieties	101(74.81)	33(24.44)	1(7.00)	-	-	646	4.79*
4. Selling price is not a limiting factor for adoption of improved rice varieties.	12 (0.09)	32(22.96)	-	69(51.11)	31(22.96)	353	2.61
5. Availability of information on improved technology influence adoption of improved rice varieties	12 (0.09)	15(11.11)	23 (17.04)	35(25.92)	30(22.22)	289	2.14
6. Farmers adopt improved rice varieties because of its high value in the market	52(38.52)	64(47.41)	3(0.02)	7(0.05)	9(0.07)	548	4.06*
7. Timely availability of improved rice varieties influence its adoption	12(0.09)	38(28.14)	27(20.0)	38(28.15)	28 (20.74)	397	2.94
8. Technologies of adoption of improved rice varieties are not too complex to implement in the farm	9 (6.70)	57(42.20)	9(6.70)	56(41.48)	4(2.96)	416	3.08*
9. Improved rice varieties are more superior than local varieties in terms of yield	60(44.44)	75(55.56)	-	-	-	600	4.44*

NB: Mean scores < 3 = Unfavourable perception
***Mean scores ≥ 3 = Favourable perception**
WS = weighted sum; WM = Weighted mean
Source: Field survey, 2016.

Conclusion and recommendation

In conclusion, fertilizer, credit, mechanization, tarpaulin and irrigation water pump were the least production resources accessed by the adopters of improved rice varieties in the study area. The attributes of early maturity, more preferred by consumers, higher yield and more market value were the major motivating factors influencing adoption of improved rice varieties. This is because these attributes play significant roles in the quality of crop and quantity of yield harvested, gives the farmers the tendency to cultivate more than once in a year and more market value leading to higher income, and improved standard of living. The government and non- governmental organization should intervene to improve on the level of access and at affordable cost in the supply of agricultural resources such as fertilizer, credit, mechanization, tarpaulin and irrigation water pump to the study area. This will not only boost the adoption and production of improved rice varieties, but will also help in meeting up with food security challenges and ensure higher farm output. Hence it is important for development agencies and policy formulators to put into

consideration degree of accessibility of potential adopters to the above mentioned production resources in the design of their programmes, this will influence adoption of improved technology in a sustainable manner and improvement of the livelihood of rural households. On the credit facilities, the farmers should form cooperatives so as to meet up with present requirements of the Central Bank of Nigeria (Anchor borrower's programme) to acquire credit at lower interest rates to increase their input purchasing power.

REFERENCES

Adedeji, T.O., Nosiru, M.O., Akinsulu, A.A., Ewebiyi, I.O., Abiona, B.G. & Jimoh T.S. (2013). Adoption of New Rice for Africa (NERICA) technology in Ogun State, Nigeria. *Journal of Development and Agricultural Economics* 5 (9): 365-371.

Asfaw, S., Shiferaw, B., Simtowe, F., and Lipper., L. (2012). Impact of modern agricultural technologies on smallholder welfare: Evidence from Tanzania and Ethiopia. Food policy, 37(3): 283 – 295.

Bezu, S. and Holden. S. (2008). "Can food for work encourage agricultural production". *Food Policy,* Vol. 33: 541-549.

Buah, S.S.J., Nutsugah, R.A.L., Kanton, I.D.K., Atokple, D. W., Afia. S., Karikarl, A.N., Wiredu, A., Amankwah, C., Osel, O., and Kabirou, N. (2011). Enhancing Farmers, access to technology for increased rice productivity in Ghana. *African Journal of Agriculture Research, 6(19): 4455 – 4466.*

Idrisa, Y.N., Ogunbameru, B.O. and Amaza, P.S. (2010). Inluence of farmers' socion –economic characteristics on Soybean seeds technology adoption in Borno State, Nigeria. *African Journal of Agricultural Research* 5 (12): 1394 – 1398.

Janvry, D. A., Dustan, A., and Sadoulet, E. (2010). Recent advances in impact analysis methods for ex-post impact assessments of agricultural technology: Options for the CGIAR. *In*: Proceeding of University of California at Berkeley. http://impact cigar org/meetings-and-events.

Kaguongo, W., Gildemacher, P., Demo, P., Wagolre, W., Kinyae, P., Andrade, J., Forbes, G., Fuglle, K. and Thiele, G. (2008). Farmer practices and Adoption of Improved potato varieties in Kenya and Uganda. International potato Centre (CIP), Lima, Peru. Social sciences Working Paper No. 5. http://cipotato.org/wp-content/uploads/2014/08/004365.pdf

Kijima, Y., Otsuka, K., and Sserunkuuma, D. (2011). "An inquiry into constraints on a green revolution in Sub-Saharan Africa: The case of NERICA rice in Uganda". *World Development*, 39 (1):77-86.

Mustapha, S.B., Undiandaye, U.C., Sanusi, A.M. and Bakari, S. (2012). Analysis of Adoption of Improved rice varieties in Jeer Local Government area of Borno State, Nigeria. *International Journal of Development and Sustainability.1 (3): 1112-1120.*

Njuguna I.M., Munyna, C. N. and Makal, S. K. (2015). Influence of demographic Characteristics on adoption of improved Potato varieties by small holder farmers in Mumberes Division Baringo Country, Kenya. *Journal of agricultural Extension and Rural Development, 7 (4): 114 – 121*

Poulton, C., Kydd, J. and Doward, A. (2006). Increasing fertilizer use in Africa: What have we learned? Discussion Paper No. 25. Agriculture and Rural Development Department, Washington DC: World Bank.

Quisumbing, A. R. and Pandolfelli, L. (2010). Promising approaches to address the needs of poor female farmers: resources, constraints and intervention. World Development, 38: 581 – 592.

Rogers, E. M. (1995). "The diffusion of innovations". 4th Edition, New York. Simon &Schuster

Stephen, L., Zubeda, M., and Hugo, D. (2014). The use of improved maize varieties in Tanzania. *African Journal of Agricultural Research*, 9 (7): 643-657.

Tripp, R. (2000). Strategies for seed systems development in sub-Saharan Africa: A study of Kenya, Malawi, Zambia and Zimbabwe. Socio-Economics and Policy Working Paper No. 2, International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Patancheru, India. Pp66.

Umeh, G.N. (2015). Determinants of Adoption of improved Rice Production Technologies in Ebonyi State, Nigeria. *Journal of Biology Agricultural and Healthcare. (5): 2224 – 3208*

World Bank (2008). World Development report "Agriculture for development". http:/web.worldbank.org